

FINAL
7N-89-CR

Overview of the project:

NASA/CX-97-

207027

We were granted 26 orbits of continuous observing time with the the Hubble Space Telescope's Goddard High Resolution Spectrograph in order to produce a comprehensive 2-D image of the RSCVn V824 Ara at MgII, CIV and for the first time ever, the coronal diagnostic line of FeXXI 1356A. These lines probed plasma at $\log(T)$ of <4 to 5.1 and at 7.0. Observations were obtained 1 May 1996. Critical gaps were filled by EUVE. Spectral features such as HeII and FeXXIII among others, observable with EUVE will probe $\log(T)$ of 5.5-7.2. Furthermore, the HST observations did not cover any features that would allow any detailed flare modelling. Combined with ground based optical and radio observations we are able to, for the first time, obtain a comprehensive 2-D map of the photosphere, chromosphere and corona of V824 Ara at a single epoch. The GHRS was used in rapid mode during the FeXXI observations in order to temporally resolve any flares that might be observed while at the same time allowing us to remove such transients from our imaging data.

All HST observations were obtained May 1, 1996 in conjunction with the EUVE data which covered 5 days (48ksec total). A light curve covering the whole observing window was obtained from the EUVE data as well as a "mean" SW spectrum (the other wavelengths had too low S/N since the exposure was shortened due to a target of opportunity).

Summary of results:

Preliminary results were presented at the Cool Stars, Stellar Systems, and the Sun in Cambridge, MA in July 1997. A copy of the two published papers (in press) is attached. The project has met or exceeded our expectations. The rapid readout data have given us an excellent data set to model in detail the flare behavior. The large number of spectral features observed between the EUVE and HST data have allowed us to compute a mean model atmosphere and compare the results to another well studied system (HR 1099 - Cycle 3 HST observation previously published). I developed a model (anisotropic macroturbulence) that fits the CIV and MgII better than previously achieved. These results have been constrained by the EUVE data. In early studies, 2 gaussians were applied to the profile. The interpretation of these features was unclear. The anisotropic macroturbulence model fits the data better than previously possible and gives a physically reasonable interpretation: there appears to be an asymmetrical distribution between the radial and tangential velocity fields. This is similar to case of the Sun.

Status of project:

The principal investigator (RCD) has completed all of the reduction and preliminary analysis of the HST and EUVE data. All the necessary software has been developed, tested and preliminary results calculated. A journal article, to be submitted to the Astrophysical Journal has been started. All of the HST and EUVE data analysis has been detailed in this paper. The draft of this portion is attached. Dr. Vladimir Airapetian (CSC/GSFC) will complete the global atmospheric modeling this fall. Co-I Dr. Klaus Strassmeier (U. Vienna) will complete the Doppler imaging of the optical data obtained simultaneously this fall as well. Dr. Jeremy Lim is nearly done with the analysis of the radio data. These results will be added to the above mentioned journal article. At this time the final modeling of the HST and EUVE data will be performed. Co-I Dr. James Neff will complete the modeling of the data.